

**PATENT COOPERATION TREATY**  
**PCT**  
**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**  
(Chapter II of the Patent Cooperation Treaty)  
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 013-03756	<b>FOR FURTHER ACTION</b>	
See Form PCT/IPEA/416		
International application No. PCT/L2004/000188	International filing date (day/month/year) 25.02.2004	Priority date (day/month/year) 25.02.2004
International Patent Classification (IPC) or national classification and IPC H01L41/09		
<p>Applicant <b>NANOMOTION LTD.</b></p> <p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input type="checkbox"/> <i>(sent to the applicant and to the International Bureau)</i> a total of sheets, as follows:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</li> <li><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</li> </ul> <p>b. <input type="checkbox"/> <i>(sent to the International Bureau only)</i> a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> <p>4. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Box No. I Basis of the opinion</li> <li><input type="checkbox"/> Box No. II Priority</li> <li><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li><input type="checkbox"/> Box No. IV Lack of unity of invention</li> <li><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li><input type="checkbox"/> Box No. VI Certain documents cited</li> <li><input type="checkbox"/> Box No. VII Certain defects in the international application</li> <li><input type="checkbox"/> Box No. VIII Certain observations on the international application</li> </ul>		
Date of submission of the demand 26.12.2005	Date of completion of this report 07.02.2006	
Name and mailing address of the International preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Steiner, M Telephone No. +49 89 2399- 5784	



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International application No.  
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**Box No. I Basis of the report**

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
    - This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
      - international search (under Rules 12.3 and 23.1(b))
      - publication of the international application (under Rule 12.4)
      - international preliminary examination (under Rules 55.2 and/or 55.3)
  2. With regard to the **elements\*** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

**Description, Pages**

1-15 as originally filed

**Claims, Numbers**

1-29 as originally filed

## **Drawings, Sheets**

1/6-6/6 as originally filed

- a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3.  The amendments have resulted in the cancellation of:

  - the description, pages
  - the claims, Nos.
  - the drawings, sheets/figs
  - the sequence listing (*specify*):
  - any table(s) related to sequence listing (*specify*):

4.  This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

  - the description, pages
  - the claims, Nos.
  - the drawings, sheets/figs
  - the sequence listing (*specify*):
  - any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes:	Claims	1-29
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-29
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-29
	No:	Claims	

**2. Citations and explanations (Rule 70.7):**

**see separate sheet**

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**Re Item V.**

**1. Reference is made to the following documents:**

D1: WO 00/74153  
D2: JP 2000-324863  
D3: US 5 453 653  
D4: WO 2004/012279

**2. Document D1, which is considered to represent the most relevant state of the art, discloses (the references in parentheses applying to this document) a method of moving a body comprising coupling one piezoelectric motor to the object to be moved and controlling the motor in such a way that oscillations in the x- and y-direction (within the plane of the object to be moved) are excited in the motor, moving the object within the plane defined by the x- and y-directions (p. 12, l. 11 - p.13, l. 32).**

From this, the subject matter of independent claim 1 differs in that the method involves controlling a plurality of motors where at least one of the motors applies a force parallel to the surface of the body to be moved, and at least one other motor is controlled simultaneously in such a way that the coupling region executes vibrations that are perpendicular to the surface.

**2.1. The subject matter of claim 1 is therefore novel (Article 33(2) PCT).**

The problem solved in the present invention may be regarded as how to provide an improved method of moving a body in one plane with piezoelectric actuators.

**2.2. The solution provided in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:**

The method proposed in the present application allows the use of a plurality of motors, where at least one motor moves the object in their dedicated direction of movement whereas at least another motor only moves in a direction perpendicular to the coupling surface of the body to be moved in such a way that when the first motor is engaged, the

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coupling region of the other motor is disengaged, thus reducing the friction to be overcome during movement.

Nowhere in the prior art it is disclosed or suggested to operate a plurality of piezoelectric motors in such a way that while at least one applies a force to the body to be moved parallel to the surface, the coupling regions of others only execute vibrations in a direction perpendicular to that surface.

**2.3.** Claims 2-15 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

**2.4.** Document D2 discloses a piezoelectric actuator with two separate vibrating sections, one section vibrating in the direction parallel, and the other perpendicular to the direction of movement, the contacting end of the actuator thus performing elliptical movements which cause the body to move (abstract and fig. 1). The operating principle is thus similar to that of the actuator in D1. Documents D3 and D4 disclose similar actuators to that disclosed in D1 with corresponding operating methods. Hence the arguments regarding novelty and inventive step given above apply accordingly also for D2-D4.

**2.5.** Independent claim 16 refers to an apparatus for performing the method claimed in claim 1. Since the features of claim 16 correspond directly to the method steps as claimed in claim 1, the arguments regarding novelty and inventive step given above apply accordingly.

**2.6.** Claims 17-29 are dependent on claim 16 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

**3.** Industrial applicability is given in the field of piezoelectric actuators.